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Cetacean sightings in Puerto Rican waters: including the first underwater photographic documentation of a minke whale (*Balaenoptera acutorostrata*)

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Understanding the distribution, seasonality, and abundance of cetaceans is of fundamental importance for conservation and management (Furry and Harrison, 2008) and is a key priority for marine mammal studies in the Caribbean[1]. In Puerto Rico, this information is critical for complying with mandatory U.S. Caribbean marine mammal stock assessments.

The majority of cetacean records in Puerto Rico come from stranding reports, including the presence of several species that were previously unknown to the island, *i.e.* melon-headed whale *Peponocephala electra* (Mignucci-Giannoni *et al.,* 1998), dwarf whales *Kogia* spp. (Cardona-Maldonado and Mignucci-Giannoni, 1999), Fraser's dolphin *Lagenodelphis hosei* (Mignucci-Giannoni *et al.*, 1999), pygmy and dwarf sperm whale *Feresa attenuata* (Rodriguez-López and Mignucci-Giannoni, 1999), Mesoplodon whales *Mesoplodon* spp. (Rosario-Delestre *et al.*, 1999), and the striped dolphin *Stenella coeruleoalba*[2]. However, caution should be taken when using stranding observations since these reports are not ideal for establishing distribution, in that they do not reflect the species true migratory range distribution (Peltier *et al.*, 2012). Sick, debilitated, and dead animals would be at the mercy of the ocean currents and can drift for long distances from the site of origin before they strand on a beach or are predated by large apex predators (Fallows *et al.*, 2013). Nonetheless, stranding observations remain highly important, especially for long term monitoring efforts and biodiversity assessments (Vianna *et al.*, 2016).

Only a few comprehensive cetacean surveys around Puerto Rico have been conducted. The first field surveys were carried out by NOAA Fisheries aboard the *Oregon II* (Roden and Mullin, 2000), and by the US National Marine Fisheries Service using both acoustic and visual techniques throughout the US Caribbean, Puerto Rico and the Virgin Islands (Swartz *et al.*, 2002). Several species such as sperm whales (*Physeter macrocephalus*), beaked whales (Ziphiidae), false killer whales (*Pseudorca crassidens*), short-finned pilot whales (*Globicephala macrorhynchus*), spinner dolphins (*Stenella longirostris*), rough-toothed dolphins (*Steno bredanensis*), common bottlenose dolphins (*Tursiops truncatus*), Atlantic spotted dolphins (*Stenella frontalis*) and, for the first time, the pantropical spotted dolphin (*Stenella attenuata*) (Mignucci-Giannoni *et al.*, 2003) were reported in this survey (Swartz *et al.*, 2002). Two aerial surveys have been conducted, but these were limited to mainly coastal areas and only focused on the south-southwest coast of Puerto Rico[3] and Vieques Island (Mignucci-Giannoni *et al.*, 2002; DiMateo, 2013). The rest of the research conducted in oceanic waters around

[1]Lucke, K., Scheidat, M., Geelhoel, S., Debort, D., Ward, N., Hatch, L., Wiley, D., McDonald, C., Reynolds, J., Hoetjes, P., Bolaños, J., Souan, H., Vandersarren, G. and Gandhilon, N. (2014) *Marine Mammals in the Wider Caribbean - Current research and priorities for future studies.* Report No. C007/14. IMARED. 39 pp.
[2]Rodríguez-Ferrer, G., Jiménez-Marrero, N., Rodríguez-Ferrer, Y. and Seda-Matos, V. (2010) First sighting and stranding of striped dolphin (*Stenella coeruleoalba*) reported for Puerto Rico. Page 37 *in* Abstracts, *National Marine Animal Health and Stranding Network Conference*, April 6-9, National Conservation Training Center, West Virginia.
[3]Mignucci-Giannoni, A.A., Guerrero, M.A., Toyos, G.M. and Rosario, R.J. (2004) *Aerial surveys for marine mammals and sea turtles off the southeast coast of Puerto Rico.* Caribbean Stranding Network. Report to EcoEléctrica, Guayama, Puerto Rico.16 pp.

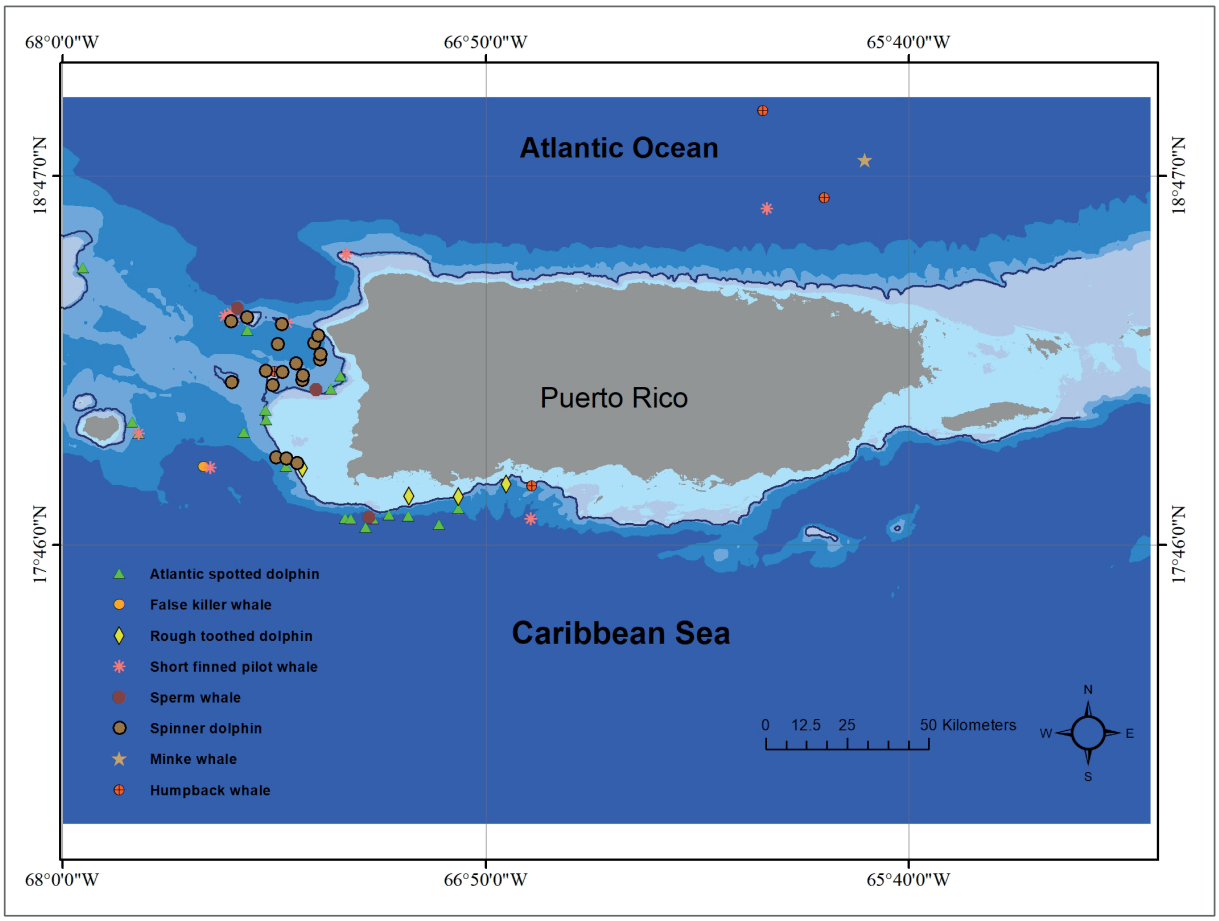

Figure 1. Geographic location of reported cetacean species 1995-2018 in Puerto Rico. Blue line represents the 200 m isobath.

the Island has focused on humpback whales[4] (Sanders *et al.*, 2005; Mackay, 2015; MacKay *et al.*, 2016).

Due to their sporadic and unpredictable nature, gathering data on cetacean strandings can be difficult. Thus, we often rely on reports from several sources such as commercial and recreational fishermen, marine law enforcement officers, diving operators, tourists, and fellow marine biologists working in the field (whose expertise is not marine mammals). These opportunistic encounters are crucial in providing important data which gives us an insight into presence data, distribution patterns, and seasonality of cetaceans which might be transient to Puerto Rican waters, however, due to logistic efforts go unnoticed. A recent example, although not of a marine mammal, was the first record of the megamouth shark (*Megachasma pelagios*) for the tropical North Atlantic Ocean within Puerto Rican Caribbean waters, which was initially reported by a tourist who witnessed the carcass approach the shore of a local beach (Rodriguez-Ferrer *et al.*, 2017).

[4]Goertz, C.M., MacKay, M.M., Bacon, C.E. and Würsig, B.G. (2015) Humpback whale (*Megaptera novaeangliae*) association patterns off Western Puerto Rico, USA. Page 45 *in* Abstracts, *21st Biennial Conference on the Biology of Marine Mammals*, 13-18 December, San Francisco, California, USA.

Initially, reports of oceanic cetaceans in Puerto Rico have been strictly opportunistic (Erdman, 1970; Roden and Mullin, 1995; Mignucci-Giannoni, 1998; Burks and Swartz, 2000; Swartz *et al.*, 2002; Bolaños-Jiménez *et al.*, 2014; Merten and Rodriguez-Ferrer, 2014). However, with the advent of smartphones, compact cameras (*i.e.* GoPro), portable GPS devices (Global Positioning System), coupled with an increase in marine-oriented recreational activities; citizen sightings offer the potential to greatly enhance the scope of reliable observations in space and time (*i.e.* Bolaños-Jiménez *et al.*, 2014).

Thus, the purpose of this paper is to compile and summarize unpublished data obtained from opportunistic sightings of oceanic and pelagic cetaceans around Puerto Rico from 1995 to 2018. This data will contribute to the overall knowledge of cetacean species by complementing observational information of cetaceans and help managers understand species occurrence, seasonality and distribution patterns in and around Puerto Rican neritic and oceanic waters.

The study area included the neritic and oceanic waters of Puerto Rico (18°12'06" N 66°39'52.24" W, Figure 1). Puerto Rico is an archipelago of approximately 140 structures that include islands, islets and keys of various sizes, surrounded

by deep waters (Méndez-Méndez and Fernández, 2015). The northern insular shelf is very narrow, with depths plunging to 8400 m into the Puerto Rico Trench (ten Brink *et al.*, 2004). Prominent features on the west coast are the islands of Mona/Monito and Desecheo, the Mona Canyon, the Desecheo Ridge, and the underwater seamounts of Pichinco and Bajo de Sico (Chaytor and ten Brink, 2010). The Mona Channel extends between Puerto Rico and Hispaniola, with water depths between 100-700 m, while the Mona Canyon drops to depths of about 5000 m (Chaytor and ten Brink, 2010). At the western end, the shelf extends from six to 10 km in width with an average depth of 18 to 20 m, but off Guánica it narrows to only three to four kilometers width and an average depth of 12 m (Morelock *et al.*, 1994). The shelf expands again to the east towards Ponce, but then narrows along the eastern coastline. This coastal zone is characterized by a series of small mangrove cays and reefs, interrupted by the presence of bays. The east coast consists of the Vieques Passage between Puerto Rico and the US Virgin Islands, which contains numerous islets and the islands of Culebra and Vieques. The passage is about 35 km long and 25 km wide, with average water depths from 12 to 31 m (NOAA, 2018).

Observational data and sightings were gathered through several sources. These included anglers participating in fishing tournaments, who were interviewed upon arrival to the weigh-stations as part of the Department of Natural and Environmental Resources Marine Recreational Statistics Program. Data was also recorded from commercial and recreational fishermen, a commercial whale watching vessel, and marine biologists that reported opportunistic species sightings to the authors. Surveys targeting several species of dolphins were also done by the first author (GRF) and are also included in this report (Table 1). These surveys were part of the Puerto Rico Dolphin Survey. Dedicated line transect surveys by the first author focused on the distribution of the bottlenose dolphin both in nearshore and pelagic waters. Several cetacean species other than *Tursiops* were recorded and are part of this note.

An informal interview was conducted with all the individuals who reported a sighting. These included questions regarding the physical characteristics of the individual/groups sighted, their location, any photographic documentation and possible behavior during the encounter. To assist with the interview, behavioral categories were described to everyone who was interviewed; travel = directional movement; social behavior = between same species or other animals (these include bodily contact such as sexual interactions); chasing one another, and signs of aggressiveness (*e.g.* fighting); probable feeding = some indications of a feeding behavior (*i.e.* repeated dives); definitive feeding = fish or any other prey in mouth is observed; and other = any activity not described (*e.g.* interactions with the boat or individual on board, boat avoidance, and interactions with other boats) (based on Melancon *et al.*, 2011). Observational data gathered from 1995 to 1997 (from January to March) was provided by the commercial whale watching boat *Viking Starship* and was also included in this note. Lastly, reports of cetacean sightings by researchers of the Department of Natural and Environmental Resources' Fish Reproductive Biology Program and from the University of Puerto Rico's Department of Marine Sciences graduate students were included. In all cases, GPS locations were recorded, and when possible, *in situ* pictures were taken of encountered cetaceans for species identification, individual identification, estimates of group size, number of calves, and behavior.

A total of 58 sightings from 1995 to 2018 were reported (Table 1). Reports from fishermen included six for commercial and eight during recreational activities. Direct observations from the whale watching boat *Viking Starship* accounted for 22 of the sightings reported. Data from the *Viking Starship* were collected during the first three months of each year from 1995 to 1997, which coincides with humpback whale breeding season in Puerto Rico. Sightings by the Puerto Rico dolphin survey consisted of 19 records, 11 records from commercial as well as recreational anglers. Lastly, sightings made by research colleagues consisted of five records.

Balaenoptera acutorostrata (Lacépède, 1804)

On 12 January 2004, fisherman Roberto Reyes was free diving and spearfishing for dolphinfish (*Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*) about 37-48 km off the north coast of Puerto Rico along a *Sargassum* sp. patch line (Figure 1). According to the observer, while retrieving a speared wahoo, a small whale appeared. At this moment, the observer managed to photograph the whale as it approached his free-diving partner (Figure 2). The whale was slim shaped, with a pointed and triangular snout and a broad and flat rostrum. The length was estimated to be 8 m. In the picture, there was a dark grey coloration on the dorsal area. A white band on the flipper is also visible from the photograph, characteristic of minke whales (Figure 2). The whale glided underwater as it approached and swam perpendicular to the diver, then swimming, approaching and moving away from the diver and then approaching back; the behavior was recorded for several minutes. Then the whale followed the boat for a couple of minutes after the encounter.

Megaptera novaeangliae (Borowski, 1781)

Three humpback whale sightings were reported by recreational fishermen during the months of March and April 2008, 2013 respectively and January 2014 (Figure 1). Group size ranged from one to 19 individuals. Observed behavior included several breaches and traveling. Humpback whale sightings have also been observed within the Mona Channel, mainly in the months of November through December, in and around proximity to the underwater seamount Bajo de Sico (Figure 3A), which is an important Nassau grouper (*Epinephelus striatus*) aggregation site in the Caribbean (Tuohy *et al.,* 2015).

Table 1. Ecological data for cetacean sightings in Puerto Rico 1995-2018

Common Name	Scientific name	Observation Date	Group Size	Location (Lat./Long.)	Reported by	Picture Y/N
Spinner dolphin	*Stenella longirostris*	9 Jan 1995	25	18°23'42" N 67°29'27.6" W	*Viking Starship*	N
		11 Feb 1995	30	18°12'32.4" N 67°25'15.6" W	*Viking Starship*	N
		3 Mar 1995	25	18°23'2.4" N 67°32'9.6" W	*Viking Starship*	N
		19 Mar 1995	50	18°19'30" N 67°18'25.2" W	*Viking Starship*	N
		1 Jan 1996	10	18°14'49.2" N 67°26'24" W	*Viking Starship*	N
		2 Feb 1996	50	18°20'42" N 67°17'45.6" W	*Viking Starship*	N
		23 Feb 1996	30	18°14'42" N 67°23'38.4" W	*Viking Starship*	N
		23 Feb 1996	15	18°14'06"N 67°20'13.2" W	*Viking Starship*	N
		8 Mar 1996	30	18°16'44.4" N 67°17'27.6" W	*Viking Starship*	N
		17 Jan 1997	30	18°22'37.2" N 67°23'42" W	*Viking Starship*	N
		31 Jan 1997	20	18°13'22.8" N 67°20'24" W	*Viking Starship*	N
		17 Feb 1997	25	18°16'4.8" N 67°21'25.2" W	*Viking Starship*	N
		28 Feb 1997	40	18°17'34.8" N 67°17'20.4" W	*Viking Starship*	N
		9 Apr 2000	100	18°0'32.4" N 67°24'39.6" W	Grisel Rodriguez-Ferrer	Y
		17 Aug 2004	3	18°19'16.2" N 67°24'21.6" W	Grisel Rodriguez-Ferrer	Y
		20 Dec 2006	30	17°59'34.8" N 67°21'10.8" W	Grisel Rodriguez-Ferrer	Y
		19 Aug 2014	80	18°0'21.6" N 67°22'58.8" W	Ricardo Jaen[5]	N
		5 Oct 2014	100	18°12'57.6" N 67°31'58.8" W	Grisel Rodriguez-Ferrer	Y
Atlantic spotted dolphin	*Stenella frontalis*	12 Feb 1995	30	18°13'58.8" N 67°13'58.8" W	*Viking Starship*	N
		19 Feb 1995	6	18°18'8.24" N 67°26'24" W	*Viking Starship*	N
		31 Mar 1996	1	18°21'32.4" N 67°29'24" W	*Viking Starship*	N
		19 Jan 1997	25	18°11'52.8" N 67°15'32.4" W	*Viking Starship*	N
		10 Oct 2000	20	18°31'55.2" N 67°56'34.8" W	Grisel Rodriguez-Ferrer	Y
		15 Oct 2000	40	18°06'43.2" N 67°26'13.2" W	Grisel Rodriguez-Ferrer	Y
		28 Jan 2005	3	17°59'2.4" N 67°22'58.8" W	Hector Lopez[6]	Y
		13 Mar 2010	50	17°51'3.6"N 67°5'52.8" W	Milton Carlo[7]	N
		7 Feb 2013	19	17°48'57.6" N 67°09'43.2" W	Milton Carlo[7]	N
		14 Mar 2013	6	17°50'27.6" N 67°13'8.4" W	Gustavo Nadal[8]	N

		10 Oct 2014	7	17°50'20.4" N 67°08'34.8" W	Grisel Rodriguez-Ferrer	Y
		16 Oct 2014	50	17°50'24" N 67°12'10.8" W	Grisel Rodriguez-Ferrer	Y
		23 Jan 2015	25	17°49'22.8" N 66°57'36" W	Grisel Rodriguez-Ferrer	Y
		27 May 2015	25	17°50'49.2"N 67°02'42" N	Grisel Rodriguez-Ferrer	Y
		18 Sep 2015	2	17°52'1.2" N 66°54'28.8" W	Grisel Rodriguez-Ferrer	Y
		25 Sep 2015	37	18°52'30" N 67°47'20.4" W	Grisel Rodriguez-Ferrer	Y
		19 Jan 2017	20	18°04'40.8" N 67°29'52.8" W	Norberto Velez[9]	Y
		28 May 2017	30	18°06'21.6" N 67°24'25.2" W	Norberto Velez[9]	Y
Rough-toothed dolphin	*Steno bredanensis*	6 Mar 2010	50	17°56'9.6" N 66°46'30" W	Jose Vega[10]	Y
		20 May 2015	12	17°58'44.4" N 67°20'13.2" W	Grisel Rodriguez-Ferrer	Y
		12 Sep 2016	50	17°54'3.6" N 66°54'25.2" W	Nicholas Hammerman, Jaaziel García-Hernández, Jack Olson[7], Mariel Cruz[7]	Y
		25 Jul 2017	20	17°54'10.8" N 67°02'38.4" W	Andres Maldonado[9]	N
Short-finned pilot whale	*Globicephala macrorhynchus*	28 Jan 1995	25	18°22'44.4" N 67°22'48" W	*Viking Starship*	N
		3 Feb 1995	12	18°23'16.8" N 67°31'33.6" W	*Viking Starship*	N
		4 Feb 1995	5	18°24'0.8" N 67°32'2.4" W	*Viking Starship*	N
		6 Apr 1996	18	18°23'56.4" N 67°33'7.2" W	*Viking Starship*	N
		31 Jan 2009	6	18°41'42" N 66°03'21.6" W	*Capehorn*	N
		18 Apr 2009	4	17°50'20.4" N 66°42'32.4" W	Dolphinfish tournament[11]	N
		25 Nov 2016	15	18°04'30" N 67°47'20.4" W	Norberto Velez[9]	Y (video)
		27 Feb 2018	30	17°58'48" N 67°35'31.2" W	Milton Carlo[7]	Y
Sperm whale	*Physeter macrocephalus*	5 Feb 1995	1	18°25'15.6" N 67°31'1.2" W	*Viking Starship*	N
		15 Mar 2005	2	18°11'45.6" N 67°17'56.4" W	Miguel Figuerola[6]	N
		10 Sep 2014	2	17°50'34.8" N 67°09'14.4" W	Grisel Rodriguez-Ferrer	Y
Humpback whale	*Megaptera novaeangliae*	1 Mar 2008	2	18°57'54" N 66°04'4.8" W	Dolphinfish tournament[12]	N
		13 Apr 2013	1	17°55'48" N 66°42'14.4" W	Grisel Rodriguez-Ferrer	Y
		24 Jan 2014	19	18°14'45.6" N 67°24'50.4" W	Grisel Rodriguez-Ferrer	Y
Minke whale	*Balaenoptera acutorostrata*	20 Jan 2014	1	18°49'40.8" N 65°47'13.2" W	Roberto Reyes	Y
False killer whale	*Pseudorca crassidens*	27 Feb 2018	1	17°59'2.4"N 67°36'36" W	Milton Carlo[7]	Y

[5]Fisherman, Blue Marlin Tournament Carolina Puero Rico (pers. comm.)
[6]Department of Natural and Environmental Resources, Puerto Rico (pers. comm.)
[7]Marine Sciences Department, University of Puerto Rico (pers. comm.)
[8]Recreational fisherman, Dolphinfish Tournament, Lajas, Puerto Rico, 14 March 2013 (pers. comm.)
[9]Commercial fisherman (pers. comm.)
[10]Recreational fisherman, Dolphinfish Tournament, Ponce, Puerto Rico, 6 March 2010 (pers. comm.)
[11]Cabo Rojo, Puerto Rico
[12]01 March 2008, Lajas, Puerto Rico

Stenella longirostris (Gray, 1828)

Spinner dolphins were reported on eighteen occasions from 1995 to 2014 (Table 1) during the months of January, February, March, April, August, October and December. All were in the Mona Channel, with reported water depths of 49 to 75 m (Fig.1). Group size ranged from three to 100 individuals, with multiple calves present in three of the 18 sightings. The dolphin species were identified by their long beak and their three-part coloration pattern (dark cape, light grey sides, and a white or light pink ventral zone; Figure 3B). We did not observe, in any of the pictures or videos analyzed, the *Stenella clymene* color pattern (dark line on the top of snout similar to a moustache, black eye ring and dark lips, dark cape that dips above the eye and the dorsal fin). On all occasions, some animals within the group interacted with the boat, but the group's main behavior was predominantly fast travel away from the boat.

Stenella frontalis (Cuvier, 1829)

Atlantic spotted dolphins were reported on 18 occasions from 1995 to 2017 in the months of January, February March, May, September, and October (Table 1). These observations were reported both within the Mona Channel and off the south coast close to the insular slope, with water depths from 90-250 m (Figure 1). Group size ranged from two to 50 individuals, with calves present in 10 of the sightings. Dolphins were identified by the spinal blaze, medium size beak and the presence of spots, in adults (Figure 3C). Interestingly, on two occasions, *S. frontalis* was observed interacting in a mixed species group with the common bottlenose dolphin off Desecheo Island (northwest coast off Rincon, PR). On one occasion (27 May 2015, refer to Table 1 for exact location), dolphins were associated with *Sargassum* sp. patches, feeding on flying fish.

Steno bredanensis (G. Cuvier *in* Lesson, 1828)

Rough-toothed dolphins were sighted on four different occasions in the south and southwest regions of the island from 2010 to 2016, in the months of March, May, July, and September. Water depth ranged from 4.5 m to 50 m (Figure 1). Dolphins were photographed and identified by their long beak, smooth sloping melon, white belly, tall dorsal fin, and dark dorsal area (Figure 3D). Group size ranged from 10 to 50 individuals, with a calf present in one of the sightings. On one occasion, a large group of approximately 50 individuals was sighted associated with *Sargassum* sp. The water depth in the area ranged from 7.6 m to 13.7 m. On all occasions, dolphins were quite active, displaying what was described as social interactions with one another.

Globicephala macrorhynchus (Gray, 1846)

Short-finned pilot whale sightings were reported in nine occasions from 1995 through 2018 during the months of January, February, April, and November (Table 1). Group size ranged from four to 30 individuals, with no calves reported. Anglers targeting dolphinfish at 27 km from shore, reported observing short-finned pilot whales frequently during fishing tournaments. Anglers reported, a 'black fish' (black-colored cetacean) with bulbous head, and broad dorsal fin. A picture of *G. macrorhynchus* was shown to the anglers to confirm identification.

Pseudorca crassidens (Owen, 1846)

On 27 February 2018, a solitary false killer whale was sighted and photographed in the Mona Channel by Mr. Milton Carlo, University of Puerto Rico - Mayagüez Department of Marine Sciences' diving safety officer (Figure 2, Table 1). Mr. Carlo sent a picture during the sighting to G. Rodriguez-Ferrer for further identification. The cetacean was described as dark gray coloration, with slender body, sickled-shaped dorsal fin and an approximate length of 5 m. The report mentioned that the false killer whale interacted with the research boat, swimming at least 10 meters from the boat for approximately 10 minutes and then leaving the area (Figure 3E).

Physeter macrocephalus (Linnaeus, 1758)

Sperm whales were sighted on three occasions from 1995 to 2014. Two of the sightings occurred within the Mona Channel and the other sighting off the insular slope along the south coast of Lajas (Table 1, Figure 1). The first sighting reports one individual traveling, and the other two sightings were of a mother and its calf swimming at the surface, with occasional breaching. In one of these sightings (10 September 2014), the adult female of the pair had a distinctive mark close to the melon area (Figure 3F). The picture was also sent to the Guadeloupe Sperm whale project for possible identification, however no match was obtained.

It has been nearly 20 years since the last published reports of cetacean sightings associated with Puerto Rican waters (Mignucci-Giannoni, 1998; Swartz *et al.*, 2002). There is no recent data regarding their presence in Puerto Rico, and this species account is useful to understand the current distribution of some of the species present in Puerto Rico.

The photographic evidence on the presence of minke whales supports the previous reported encounters and acoustic data regarding the species (Swartz *et al.*, 2002; Risch *et al.* 2014). As far as we know, this is the first confirmed underwater photograph of a minke whale in Puerto Rico.

Figure 2. Minke whale (*Balaenoptera acutorostrata*) 30 miles off Boca de Cangrejos, Carolina Puerto Rico. Photo credit R. Reyes.

Since the early 1960s, several scientists have reported a small species of whale from deep waters off the north coast of Puerto Rico (Erdman, 1970; Roden and Mullin, 1995; Mellinger *et al.*, 2000; Clark and Gagnon, 2002; Swartz *et al.*, 2002). Mitchell (1991) suggested a possible winter distribution of the species in the West Indies. From the photograph (Figure 2) we can easily identify the morphological characteristics of the species (*i.e.* slim shape, with a pointed head, dark grey coloration on the dorsal area and a white band on the flipper) (Perrin and Brownell, 2002). The whale was sighted in January, which coincides with the Mitchell (1991) winter distribution hypothesis of the species (Risch *et al.*, 2014). Mignucci-Giannoni (1998) mentioned three sightings reported "between the northeast corner of Puerto Rico and San Juan", but the sightings were not part of his spatial analysis because the sightings were far from the study area. Acoustic surveys have in the past identified the very characteristic "thump train" and "pulse tones" close to the Puerto Rico trench, as well as other deep-water sites around the island (Roden and Mullin, 1995; Mellinger *et al.*, 2000; Clark and Gagnon, 2002; Swartz *et al.*, 2002), indicating the presence of the species in this zone. The previous discussed acoustic data coincides with the location of the minke whale sighting reported in this note. Although our observation is from 2004, being the first known photograph of a minke whale in waters close to Puerto Rico, we consider this report a very important contribution for the knowledge of oceanic cetaceans in Puerto Rico.

Additionally, several of the reported sightings in this note confirmed the presence of species in months (seasons) different from what has been published previously. For example, all previous spinner dolphin sightings have only been reported during the fall months (August-December), and not during the winter months (January-April) (Mignucci-Giannoni, 1998; Swartz *et al.*, 2002; Mackay, 2015). Similarly, for Atlantic spotted dolphins, our reports confirm the species in Puerto Rico in May, October, and December - months that had not been previously reported (Mignucci-Giannoni, 1998; Swartz *et al.*, 2002; Mackay, 2015). In the Dominican Republic it has been suggested that spotted dolphins might be residents year-round[13]. This could be the case for Puerto Rico,

[13]Whaley, A.R., Parsons, E.C.M., Serrallés, R. and Bonnelly, I.D.C. (2006) Dolphin ecology and behavior in the southeastern waters of the Dominican Republic: preliminary observations. Paper SC58/SM12 presented to the Scientific Committee, International Whaling Commission, St Kitts, May-June 2006. [Available from the Office of the International Whaling Commission, The Red House, 135 Station Road, Impington, Cambridge, Cambridgeshire CB4 9NP, UK, <http://iwcoffice.org/>].

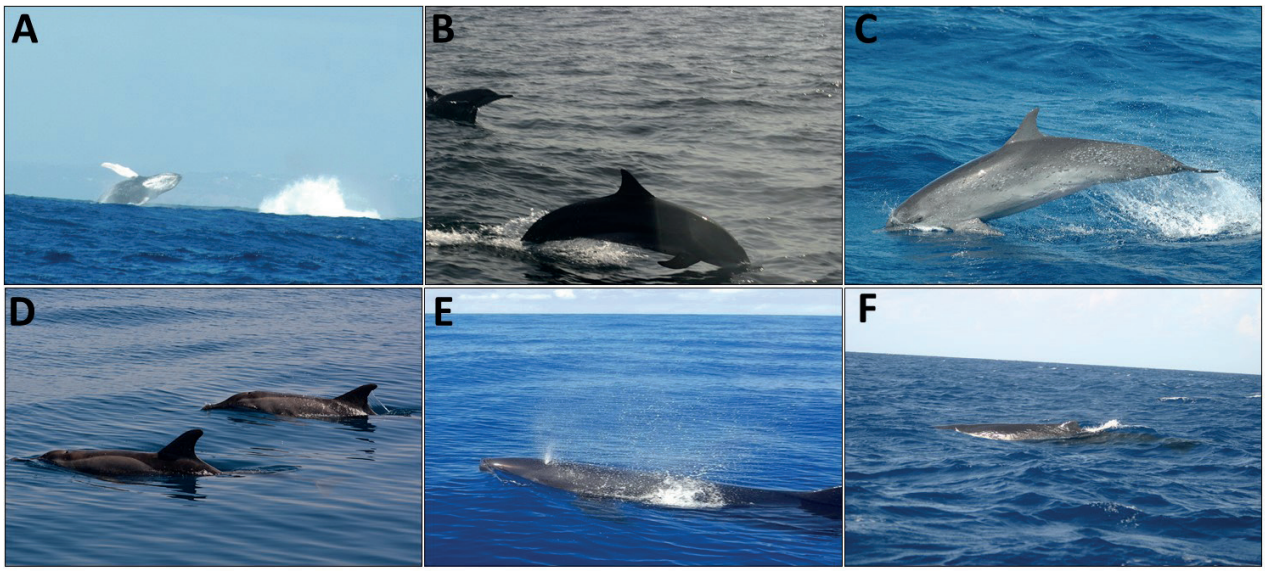

Figure 3. Reported species. A) Humpback whale (*Megaptera novaeangliae*) at Bajo de Sico, B) Spinner dolphin (*Stenella longirostris*) 17.7 km off Punta Guaniquilla, Cabo Rojo, C) Atlantic spotted dolphin (*Stenella frontalis*) 8.0 km off Punta Brea, Guánica, Puerto Rico, D) Rough-toothed dolphin (*Steno bredanendis*) 12.9 km from Punta Mojacasabe, Cabo Rojo, Puerto Rico, E) False killer whale (*Pseudorca crassidens*) 42.2 km off Punta Mojacasabe, F) Sperm whale (*Physeter macrocephalus*) 28.2 km off La Parguera, Lajas. Photos A-D and F by G. Rodriguez-Ferrer; photo E by M. Carlo.

and the species should be studied further. Rough-toothed dolphins are considered rare in Puerto Rico. Mignucci-Giannoni (1998) states that the species is present from January through April, while other colleagues report it in September (Halpin *et al.*, 2009; DiMateo, 2013). Our records cover the months of March, May, July, and September; thus, adding a late summer report for the species. We then propose that *S. longirostris*, at least the individuals found in Puerto Rican waters, consist of a population with a year-round presence. However, we recognize that there need to be additional studies to fully confirm this.

For short-finned pilot whales, past reports spanned most of the year. Erdman (1970) described the species with an abundance distribution peak from April to October, whereas the rest of the reports extended that period to winter (Mignucci-Giannoni, 1998). The reports by Swartz *et al.* (2003) and MacKay (2015) are the result of surveys of humpback whales conducted during the winter season, and therefore all their reported sightings are between January and April. Our observations increased their range from November through April. Humpback whale sightings fall within the breeding season, late fall-early spring (Mignucci-Giannoni, 1998; Mackay, 2015). Regarding sperm whales, their presence near the island of Puerto Rico has been reported in the past (Mignucci-Giannoni, 1998; Roden and Mullin, 2000; Swartz *et al.*, 2002). This is the only sighting reported in this note which concurs with the seasonality proposed by Mignucci-Giannoni (1998), late fall to early winter, and gives insight into how little we know about this species in Puerto Rican waters. Similar to our sighting in the Dominican Republic there is a report of sperm whales off the south coast, also in September (Vázquez-Castán *et. al.*, 2012).

The presence of false killer whales was just recently reported (Merten and Rodriguez-Ferrer, 2014). Their sighting and subsequent stranding of an apparently sick individual occurred on the south coast of Puerto Rico, increasing its distribution range within the greater Caribbean. Closer to Puerto Rico, there was a reported stranding in St. Croix US VI, back in 2002 (case number NEPST 840, SER 02-566, coordinates 17°43'0.3" N 64°52'58" W)[14].

Excluding minke and humpback whales, which are considered migratory, the remaining cetacean species reported in this note are presumed to be residents of the Wider Caribbean region (Weir *et al.*, 2011). Artificial seasonality, reported in much of the scientific literature, may just be the result of small and limited study areas and winter seasonality, which does not cover the entire population movement, range, and habitat. A general Caribbean stock has already been suggested for Atlantic spotted dolphins (Caballero *et al.*, 2013) and for rough-toothed dolphins (da Silva *et al.*, 2015).

When grouped together, these sightings and stranding locations (Figure 1) highlight areas that may require stronger conservation effort for pelagic cetaceans in part from federal and local agencies. Due to its geomorphology, the Mona channel appears to be an important region, and possibly a hotspot, providing suitable habitat for local and transient pelagic cetaceans. MacKay (2015) did propose possible hot spots on the west and northwest coasts of Puerto Rico for the migratory

[14]Marine Mammal National Stranding Database, accessed 20 December 2018.

humpback whale. These zones are also very important areas for local fishing industries and are protected with seasonal fishing closures, especially for red hind (*Epinephelus guttatus*) and Nassau grouper spawning aggregations (Ojeda *et al.*, 2007; Tuohy *et al.*, 2015).

The lack of long-term studies should not be an obstacle to estimate population status. Opportunistic encounters can aid in discerning the distribution of species in space and time (Peltier *et al.*, 2012). Puerto Rico's marine mammal fauna sighting compilation from several sources such as fishermen, boaters and the general public has been done in past by Erdman (1970) for the 1960s and 1970s and by Mignucci-Giannoni (1989) for the late 1980s. These opportunistic observations, which are mainly done by citizen-scientists, have been recognized as an important tool for gathering ecological data on cetaceans (Chandler *et al.*, 2017).

To maintain optimal populations, information on the status, abundance, geographic range, needs and relationship of contiguous populations is essential. Once discrete populations are defined, their status may be monitored using standard research techniques to detect and evaluate any significant changes in the populations, and to determine the causes of such changes. Baseline data such as the one presented in this report can help evaluate the needs of research and assessments in the US Caribbean jurisdiction.

Sighting reports combined with focused research can help improve the understanding of a species and provide a great tool for community outreach and involvement, since the person that reports these sightings becomes aware of the species and will be keener to protect what has been "discovered".

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